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Influence of pre-lab online resources on student preparedness and academic performance for thermodynamics: a longitudinal study

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ABSTRACT

CONTEXT

In general, modern day engineering students carry a heavy academic workload (Kausar, 2010; Lindsay & Rogers, 2010). Consequently, the preparation time the students have prior to classes or assessments have become strictly limited, specifically in a fast moving and tightly packed modern society. Engineering is a practice-based technical profession and laboratory classes provide opportunities for students to develop the hands-on technical capabilities that go beyond the theoretical understanding. There is existing research suggesting that students face information overload during today's engineering lab-classes mainly due to lack of preparation time and opportunity. This information overload and lack of preparation have been reported as key drivers of decreasing the likelihood of effectively achieving intended learning outcomes (Johnstone, 1997; Jones & Edwards, 2010).

PURPOSE OR GOAL

Pre-lab resources are a mechanism that can be used to minimise the information overload on students during laboratory classes. Pre-lab resources aim to provide relevant information and lab-protocols prior to students actually attending the class and prepare them effectively. Accordingly, this paper aims to longitudinally evaluate the actual influence of pre-lab online learning resources on student preparedness and academic performance in the context of a final year engineering thermodynamics course unit in a large public university in Australia.

APPROACH OR METHODOLOGY/METHODS

An online audio, video and text-based pre-lab resources framework has been developed and introduced to the final year engineering thermodynamics course unit under consideration. Qualitative and quantitative data is collected via student attitudinal surveys during consecutive years (i.e., 2020-2021) in order to thematically analyse the student perspective on 'academic preparedness' they possess as a consequence of engaging (or not engaging) with the pre-lab resources framework. Simultaneously, the academic performance of the students is evaluated through their marks on specific assessment items and overall grades. Finally, the correlations between the quality of pre-lab resources, student preparedness and academic performance are determined in a gradual manner.

ACTUAL OR ANTICIPATED OUTCOMES

In one of our recently submitted journal article manuscripts (*under review* at the moment), it has been demonstrated that there are correlations between the quality of the online pre-lab resources,

student preparedness and academic performance. However, that study was based on data from only one iteration of the course unit in one year (i.e., 2020). It is anticipated that through longitudinal analysis of data for multiple years, these correlations will be established in an even stronger manner for a '*multiple-iterations*' scenario, increasing the validity of the outcomes of the overall research investigation.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

It is anticipated that through this longitudinal study, the influences of an online pre-lab resources framework on student preparedness and academic performance could be determined and established in a stronger manner. It is also expected that the 'student perspective' derived through comprehensive attitudinal surveys will enhance the richness and validity of the overall research investigation while demonstrating the transferability of the findings to other comparable engineering courses such as fluid mechanics.

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KEYWORDS

Student preparedness; Pre-lab learning resources; Academic performance; Engineering education;

Online learning